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CANADA

REQUIREMENTS FOR PROFESSIONAL PERSONNEL

1956 - 1958

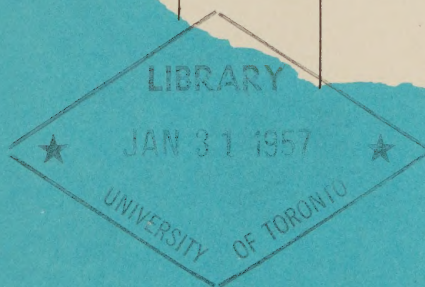
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For 1956, 57, 58 employers expect
an average annual increase of over
10% in requirements for engineers
and scientists



DEPARTMENT OF LABOUR
UNEMPLOYMENT INSURANCE COMMISSION

OTTAWA, CANADA

NOVEMBER, 1956

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REQUIREMENTS
FOR PROFESSIONAL PERSONNEL
1956 - 1958

DEPARTMENT OF LABOUR
in co-operation with the
UNEMPLOYMENT INSURANCE COMMISSION

Ottawa, November 1956

Hon. Milton F. Gregg
Minister

A. H. Brown
Deputy Minister



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Introduction

In June 1956, a questionnaire survey was made of the requirements for professionally-trained personnel in Canada. The report that follows is based on the analysis of 720 returns from industry and on returns from provincial governments, federal government departments and agencies, and universities and colleges in Canada.

The present 1956 biennial survey of requirements for professional personnel is the fifth survey in the series. Unlike the preceding one made in 1954, this survey includes government departments and agencies, both provincial and federal, and universities and colleges. It was felt that extension of coverage to these two additional areas, both major employers of professionally-trained personnel, would greatly add to the value of the survey.

The major purpose of the survey was to obtain from employers estimates of their probable requirements for some 20 different categories of professional workers for each of the years 1956, 1957 and 1958. From these data, as well as from actual employment figures obtained in this survey and from information in the 1954 survey, it was possible to estimate the changes in the demand for professional personnel from 1952 to 1958 on the part of industrial employers, and from 1954 to 1958 on the part of government agencies and universities and colleges. Employers were also asked to specify some of the reasons for their recruitment difficulties, if any, to state the effects of any shortages of professional manpower that they experienced, and to indicate their main recruitment sources of professionally-trained personnel.

At January 1, 1956, employers from all three sectors who co-operated in the survey employed a total of 30,200 professional persons. Of these, 19,930 were employed by industry, 8,845 by government, and 1,425 by universities and colleges. At the same date, total employment of the co-operating establishments in the industrial sector stood at 661,887. Of the 30,200 professional persons covered in the survey, 16,915 were engineers, 5,052 scientists and 8,233 were in other professions.

Industrial employers covered in the survey were initially selected to include: (1) firms employing more than 500 persons from every division of industry; (2) firms employing more than 200 persons, from a selected group of industries where the nature of operations requires a greater-than-average number of professional employees. The list of employers was then distributed to the regional offices of the National Employment Service with the request to survey each firm and to obtain additional reports from any other firms that were considered to be large employers of professionally-trained personnel.

Of the 720 industrial establishments co-operating in the survey, 25 employed over 5,000 persons; 40 employed from 2,001 to 5,000; 79, from 1,001 to 2,000; 145, from 501 to 1,000; 214, from 201 to 500; and 217 firms employed 200 persons and under.

For purposes of the survey, professional personnel were considered to include only university-trained persons and members of recognized professional organizations. It should be pointed out, however, that in many instances employers classified the field of specialization of their personnel on the basis of the function performed by the employee rather than on the type of degree held.

In this report the data on requirements represent anticipated changes in the number of professional workers employed over the periods specified. They do not refer to total hirings which would also reflect needs arising from retirements and transfers or resignations. In Part III, for example, an increase of 12.6 per cent in requirements for chemists in 1956 indicates that employers expect to employ 12.6 per cent more chemists in 1956 than they actually employed at the end of 1955. Similarly, the increase of 9.9 per cent for 1957 indicates that employers will employ 9.9 per cent more chemists in 1957 than they expect to have in their employ at the end of 1956. The yearly percentage increases in 1956, 1957 and 1958 are then averaged in order to facilitate comparison of the prospective requirements for the different professional categories covered in the survey. These averages, referred to in the body of the report as annual average rates of increase, represent in each case an arithmetic mean of the three year-to-year increases in requirements anticipated for 1956, 1957 and 1958.

The extension of the coverage of the present survey beyond the industrial sector to government agencies and colleges and universities made it possible to estimate prospective requirements for several categories of professional personnel not only in terms of the specific requirements of each of these three sectors, but also in terms of the requirements of the economy as a whole. The combined requirements of all three sectors, shown as "total" requirements in the tables in Part III, were calculated in each instance with regard to the actual distribution of each category of professional personnel among the three sectors. For the purpose of aggregating the requirements of each sector, weights were developed on the basis of data obtained from the Technical Personnel Register of the Department of Labour.

Of the three broad groups of establishments referred to as sectors, the largest group, "industry", includes enterprises and establishments other than agencies of the federal and provincial governments and colleges and universities. Crown corporations are included under "industry". "Government agencies" includes federal and provincial government departments and agencies, excluding Crown corporations. "Colleges and universities" includes institutions of higher learning granting degrees in professional fields.

Satisfactory information was obtained from the 1956 survey of requirements for professional personnel on 18 professional categories, and forms the basis of the analyses of individual professions in Part III. These 18 professions include eight engineering groups, namely aeronautical, chemical, civil, electrical, geological, mechanical, metallurgical, and mining; five scientific fields, namely, biology, chemistry, geology, mathematics and physics; and six other professional fields, namely, agriculture, architecture, degree accountancy, commerce or business administration and forestry. A number of other engineering categories were covered in the survey and although not large enough to warrant separate analysis, they were included in the over-all totals for engineering. No attempt was made to extend the coverage of the survey to such classes of professional personnel as lawyers, medical doctors, dentists and veterinarians who tend to practice as individuals or in partnerships.

The results of the present biennial survey indicate a substantial increase in expected demand for engineers and scientists in the three years 1956, 1957 and 1958. The need for an increasing number of professionally-qualified persons is characteristic of industrial firms, governments, and universities and colleges. The 1956 survey also reveals that the need for professional manpower is expected to be greater from 1956 to 1958 than it was from 1954 to 1956.

For the engineering profession as a whole, the increase in employment opportunities in industry is expected to average 12.2 per cent during 1956-58. The increase forecast in 1954 for the 1954-56 period was 7.6 per cent. In the five scientific fields of biology, chemistry, geology, mathematics and physics, the increase forecast for 1956-58 is the same as that for engineering, 12.2 per cent. In 1954, employers expected an average increase of 9.2 per cent for the 1954-56 period. In the other professions reported on by employers, a substantial increase in demand is also expected. It is interesting to note, however, that while employers expect an increase in demand for professional personnel for each of the three years 1956 to 1958, they indicate a declining rate of increase in demand for 1957 compared with 1956 and for 1958 compared with 1957. It is considered that the average for the three years is probably the more accurate estimate. One possible explanation for the declining rate of increase is that employers became more conservative in their estimates as the forecast period went farther into the future and became less certain.

The stronger demand for professional staff indicated in the 1956 survey, compared with that of 1954, coincides with a considerably improved general economic situation. Questionnaires for the 1954 survey were circulated to business firms at a time when over-all economic activity was not experiencing a period of expansion. In fact, in 1954 the Gross National Product was estimated to have fallen almost 2 per cent below the 1953 figure. On the other hand, the 1956 survey was made at a time when economic activity in the country had reached its highest point in history and was continuing to expand. The extent to which the

present economic climate may have created an overly-optimistic attitude towards the need for more engineers and scientists cannot, of course, be estimated.

Apart from the effects of economic conditions on the forecasts of requirements for professional personnel, the projections are subject to errors inherent in such forecasts because of the difficulty employers face in estimating requirements for particular kinds of workers several years in advance.

This report constitutes only one of several methods of estimating future requirements for professional personnel. In evaluating estimated net requirements for professional manpower in relation to supplies, it should be recognized that in addition to college and university graduation, a number of other factors such as immigration, emigration and the up-grading of personnel into professional occupations, also play a part in determining the extent to which total supplies match requirements.

Part I — Summary of Requirements

REQUIREMENTS FOR ENGINEERS AND SCIENTISTS

During 1956, 1957 and 1958, net requirements for engineers are expected to increase at an average annual rate of 11.4 per cent and for scientists at an average annual rate of 9.8 per cent. The actual rate of increase in employment during 1955 was 9.9 per cent for engineers and 5.6 per cent for scientists.

Although the estimated average increases in requirements for 1956 to 1958 are higher than the actual rate of increase during 1955, this does not necessarily indicate that employers anticipate an increase in demand for engineers and scientists. It rather implies that employment gains during 1955 were probably restricted by the limited supply of professional workers. The unsatisfied demand of the past few years for engineers and scientists is also probably reflected in the estimates of future requirements and may have resulted in the inflation of the estimates above what could be expected solely from the year-to-year growth in the economy.

The greatest increases in requirements for both engineers and scientists from 1956 to 1958 are expected to occur in the industrial sector. Average annual increases of 12.2 per cent are anticipated for both. This compares with actual increases during 1955 of 10.8 per cent for engineers and 6.5 per cent for scientists.

Colleges and universities anticipate an average annual increase in requirements of 6.8 per cent for engineers and 7.2 per cent for scientists. Government agencies anticipate gains of 7.7 per cent for engineers and 6.7 per cent for scientists.

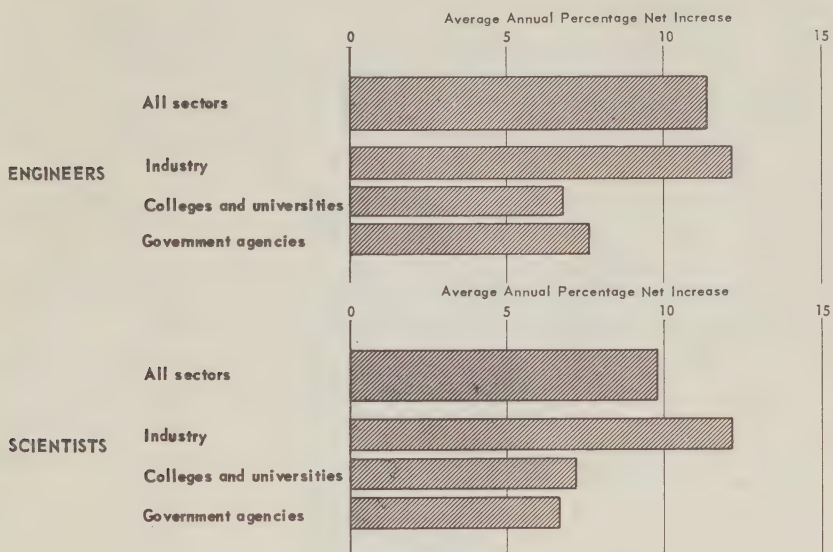
*Requirements for Engineers and Scientists
by Major Employment Sector*

Employment Sector		Percentage Net Increase	
		Actual 1955	Forecast Annual Average 1956-57-58
Engineers	All sectors	9.9	11.4
	Industry	10.8	12.2
	Colleges and universities	8.7	6.8
	Government agencies	4.9	7.7
Scientists	All sectors	5.6	9.8
	Industry	6.5	12.2
	Colleges and universities	7.1	7.2
	Government agencies	3.0	6.7

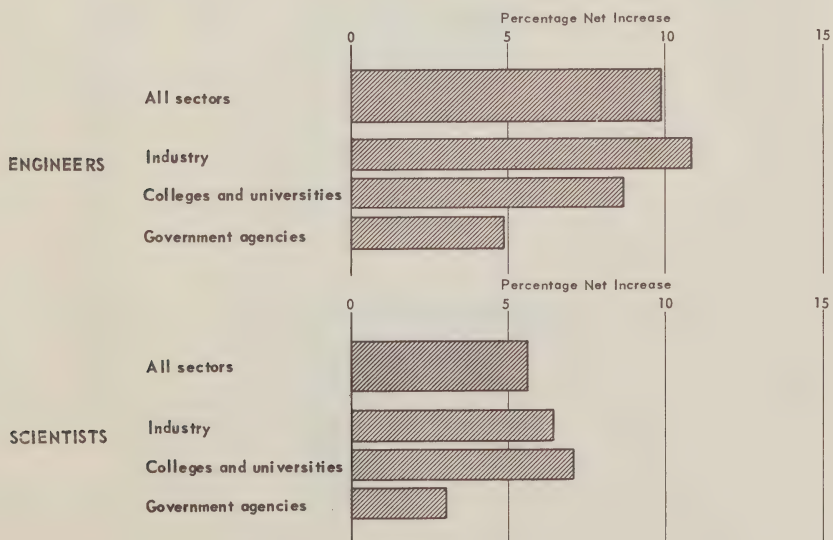
The introduction to this report contains a description of the scope, methods and terminology used in the survey. The questionnaire used is reproduced in the appendix.

.EMPLOYERS ANTICIPATE AN AVERAGE ANNUAL NET INCREASE OF
OVER 10 PER CENT IN REQUIREMENTS FOR ENGINEERS AND SCIENTISTS DURING
1956, 1957, 1958

.THE GREATEST INCREASES ARE EXPECTED
IN THE INDUSTRIAL SECTOR



.DURING 1955 EMPLOYMENT OF ENGINEERS INCREASED 9.9 PER CENT
AND SCIENTISTS 5.6 PER CENT



COMPARISON OF REQUIREMENTS BY PROFESSION

Substantial increases in net requirements for most of the engineering fields are anticipated over the three-year period 1956 to 1958. The greatest gains are expected to occur in the aeronautical, mechanical, metallurgical, chemical and geological fields, the anticipated average annual increases in these five fields ranging from 17.4 per cent down to 12.4 per cent. The lowest anticipated increase is in requirements for mining engineers, with an expected average annual gain of 6.5 per cent. In two fields, aeronautical and metallurgical engineering, the actual increases that occurred during 1955 exceed the anticipated average increases for 1956 to 1958. Actual gains in each of these fields were over 19 per cent.

In the science fields, requirements for chemists and mathematicians are expected to increase most rapidly, the average gains for each exceeding 10 per cent. The actual 1955 employment increase exceeds the average annual increase in requirements expected for the following three years only for geologists and by only two percentage points.

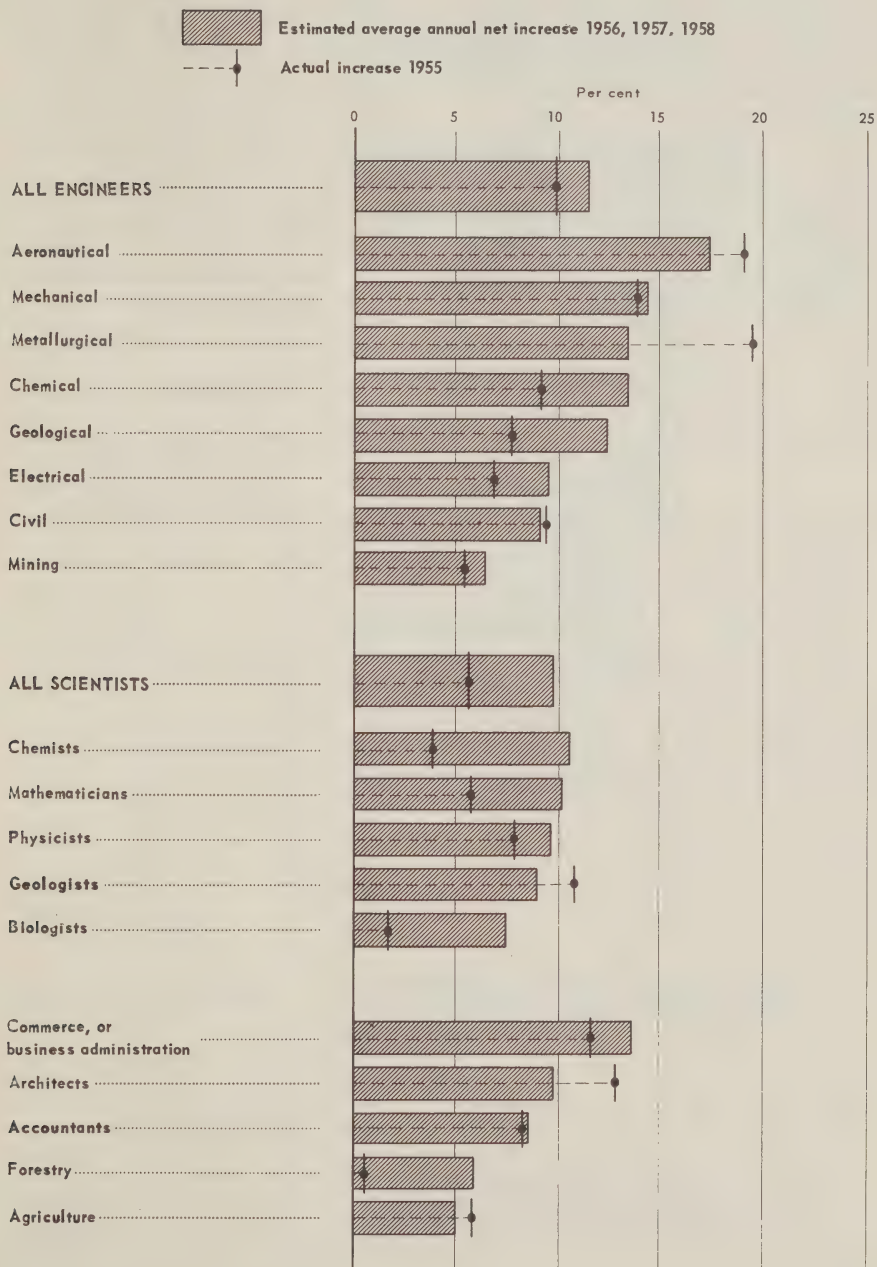
The estimated increase in requirements in the commerce or business administration field is high, with an average annual rate of gain of 13.5 per cent. Average increases in requirements of 9.7 per cent and 8.5 per cent are anticipated for architects and accountants. The lowest expected gains are in the fields of forestry and agriculture.

Requirements for Professional Personnel by Professional Field

Professional Field	Percentage Net Increase	
	Actual 1955	Forecast Annual Average 1956-57-58
All Engineers	9.9	11.4
Aeronautical	19.2	17.4
Mechanical	13.9	14.4
Metallurgical	19.4	13.4
Chemical	9.1	13.4
Geological	7.6	12.4
Electrical	6.8	9.5
Civil	9.4	9.1
Mining	5.4	6.5
All Scientists	5.6	9.8
Chemists	3.9	10.5
Mathematicians	5.7	10.1
Physicists	7.8	9.7
Geologists	10.8	8.9
Biologists	1.7	7.5
Commerce or Business Administration	11.5	13.5
Architects	12.7	9.7
Accountants	8.3	8.5
Forestry	0.4	5.8
Agriculture	5.8	5.0

. . . . REQUIREMENTS FOR ENGINEERS ARE EXPECTED TO INCREASE MOST RAPIDLY IN THE AERONAUTICAL, MECHANICAL, METALLURGICAL AND CHEMICAL FIELDS

. . . . REQUIREMENTS IN THE SCIENCE FIELDS ARE EXPECTED TO INCREASE MOST RAPIDLY FOR CHEMISTS, MATHEMATICIANS AND PHYSICISTS



Part II — Recruitment and Effects of Shortages

RECRUITMENT DIFFICULTIES

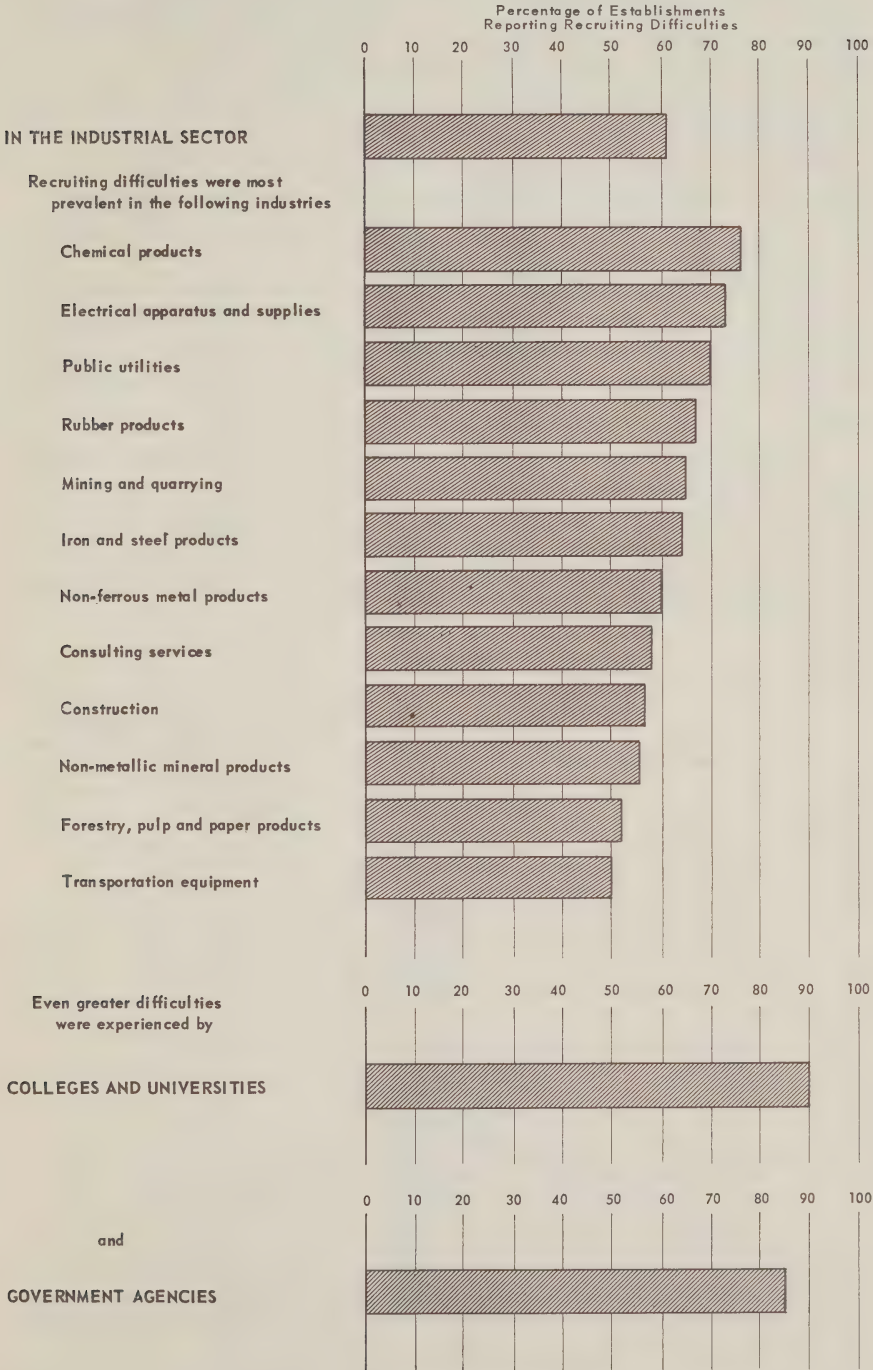
In the industrial sector, 61 per cent of the firms surveyed reported that they had experienced difficulties in recruiting professional staff during 1954 and 1955. Ninety per cent of the reporting institutions in the college and university sector and about 85 per cent of the agencies in the government sector reported difficulties in the hiring of professionals during the same period.

In 12 of the industries covered, more than 50 per cent of the establishments surveyed reported recruiting difficulties. The highest proportions of establishments reporting difficulties were in the chemical products, electrical apparatus and supplies and public utilities industries. In each of these three, 70 per cent or more of the reporting firms had experienced difficulties in meeting their requirements for professional workers.

*Difficulties in Recruiting Professional Personnel
by Employment Sector*

Employment Sector	Percentage of Establishments Reporting Recruiting Difficulties
Industry	61
Chemical products	76
Electrical apparatus and supplies	73
Public utilities	70
Rubber products	67
Mining and quarrying	65
Iron and steel products	64
Non-ferrous metal products	60
Consulting services	58
Construction	57
Non-metallic mineral products	56
Forestry, pulp and paper products	52
Transportation equipment	50
Colleges and universities	90
Government agencies	85

. . . . THE MAJORITY OF EMPLOYERS EXPERIENCED DIFFICULTIES IN
RECRUITING PROFESSIONAL PERSONNEL DURING 1954 AND 1955



COMPARISON OF RECRUITMENT DIFFICULTIES BY PROFESSION

Industry

In the engineering field, a greater proportion of firms reported difficulties in recruiting mechanical, mining, electrical and chemical engineers during 1954 and 1955 than in recruiting professionals in any other branch of engineering. Of the firms employing mechanical engineers, for example, 47 per cent reported recruiting difficulties; of those employing mining engineers, 42 per cent reported difficulties and of those employing electrical or chemical engineers, 40 per cent reported difficulties. The proportion of employers of other engineering professions who reported difficulties ranged from 36 per cent for civil engineers to 26 per cent for aeronautical engineers.

In the science fields, the proportion of firms reporting recruitment difficulties was greatest for employers of physicists (37 per cent) and of mathematicians (35 per cent) and in other fields covered in the survey, the proportion was greatest for employers of architects (34 per cent).

Colleges and Universities and Government Agencies

Recruiting difficulties in colleges and universities and in government agencies were generally more prevalent than in industry. In the engineering fields in particular, government agencies reported difficulties in considerably higher proportions than industry. In the science fields, the proportion of both colleges and universities and government agencies reporting difficulties was highest for physicists.

Recruitment Difficulties by Profession

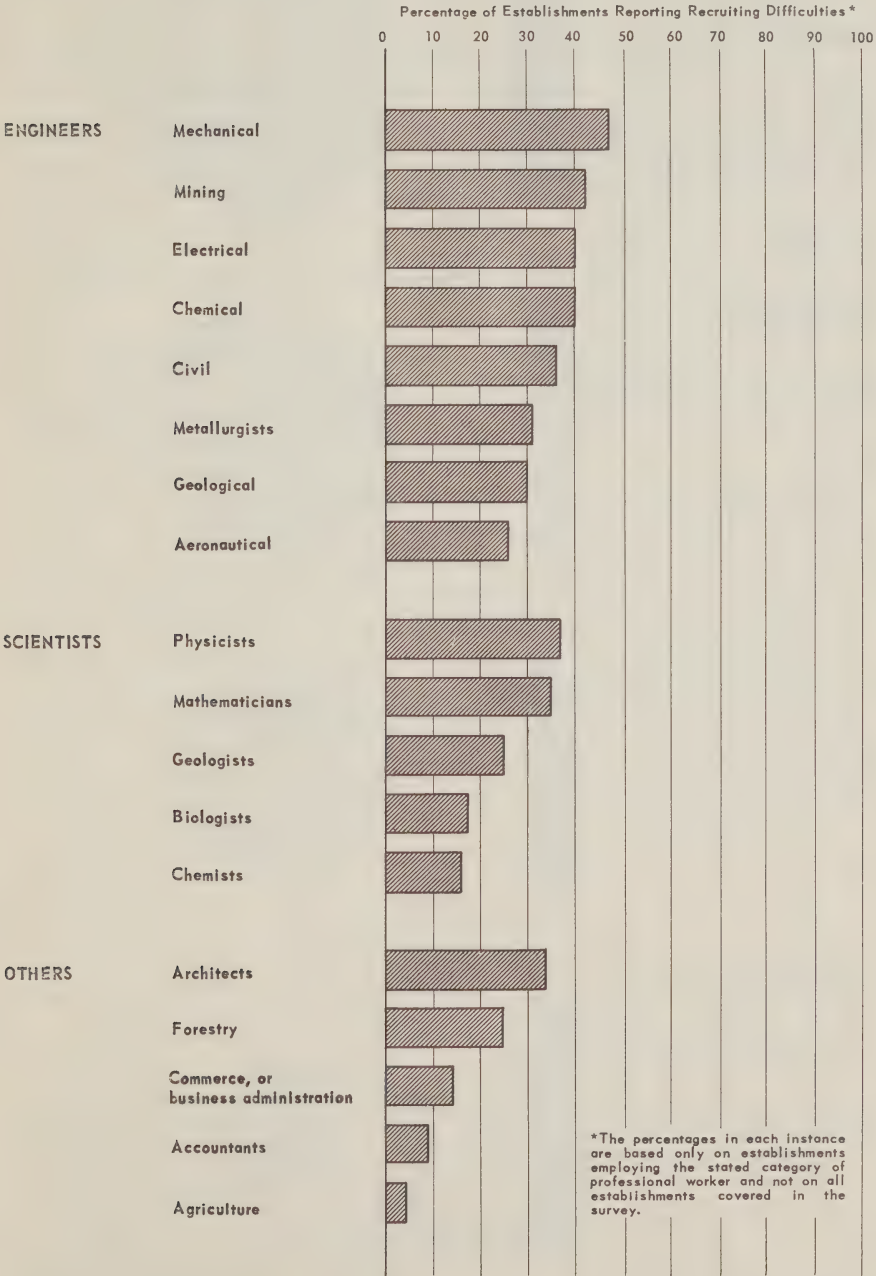
Professional Field		*Percentage of Establishments Reporting Recruiting Difficulties, 1954-55		
		Industry	Colleges & Universities	Government
Engineering	Mechanical	47	33	53
	Mining	42	—	38
	Electrical	40	42	79
	Chemical	40	38	43
	Civil	36	50	85
	Metallurgical	31	29	50
	Geological	30	*	*
	Aeronautical	26	*	80
Sciences	Physicists	37	70	56
	Mathematicians	35	55	30
	Geologists	25	6	33
	Biologists	17	20	42
	Chemists	16	20	23
Others	Architects	34	*	60
	Forestry	25	*	36
	Commerce or Business Administration	14	29	33
	Accountants	9	—	50
	Agriculture	4	*	17

Note: The percentages in each instance are based only on establishments employing the stated category of professional worker and not on all establishments covered in the survey.

* Absolute figures too small for calculation of percentages.

. IN THE INDUSTRIAL SECTOR DURING 1954 AND 1955 RECRUITMENT OF ENGINEERS WAS MOST DIFFICULT IN THE MECHANICAL, MINING, ELECTRICAL AND CHEMICAL FIELDS

. IN THE SCIENCE FIELDS, RECRUITMENT DIFFICULTIES WERE MOST PREVALENT FOR PHYSICISTS AND MATHEMATICIANS



SOURCES OF PROFESSIONAL PERSONNEL

Employers in industry were requested to indicate to what extent they were hiring professional personnel from each of four major sources listed in the questionnaire — “Canadians with professional experience”, “new university graduates”, “recent immigrants to Canada”, and “directly from abroad”.

As the accompanying chart indicates, 83 per cent of all the firms surveyed were hiring “Canadians with professional experience”. Of these, 17 per cent were hiring exclusively from this source and 44 per cent hiring from half to nearly all their professional staff from this source.

Since unemployment has been negligible in recent years among professional workers, the high proportion of employers who were hiring “Canadians with professional experience” indicates that competition between firms for the services of professional personnel has been extremely keen.

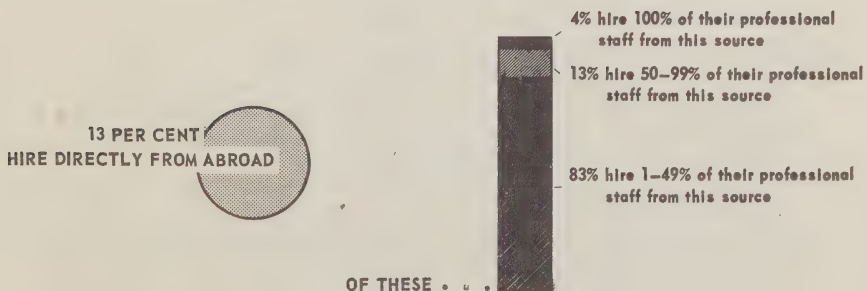
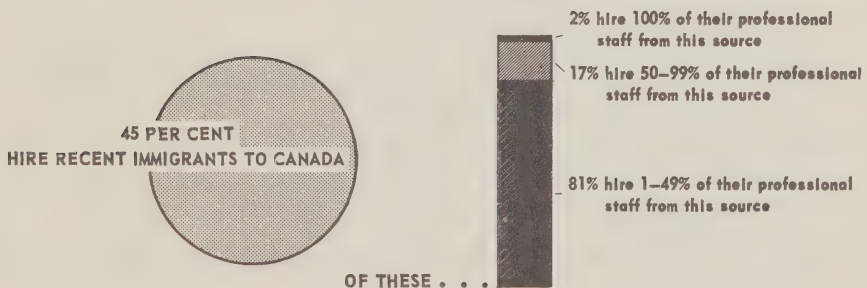
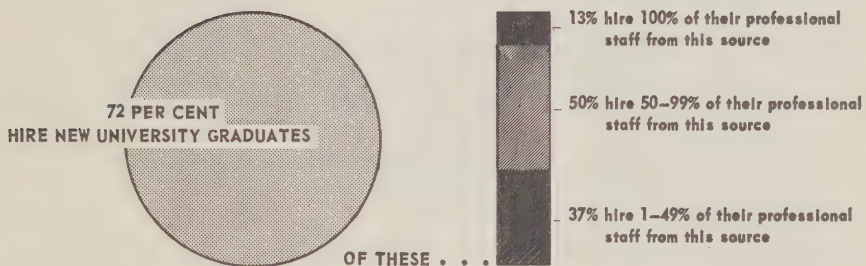
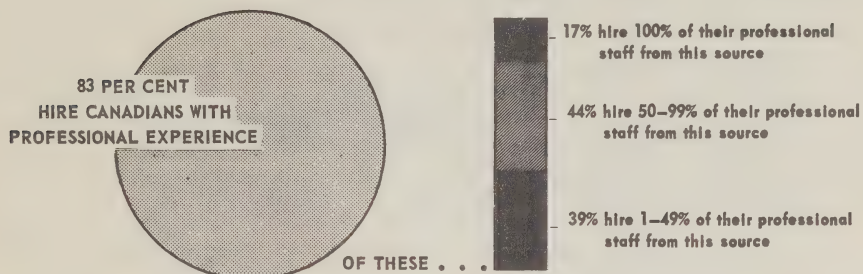
“New university graduates” was the next most frequently mentioned source of hiring; 72 per cent of employers hired new graduates. Of these 13 per cent hired exclusively from this source and 50 per cent obtained from half to nearly all of their professional personnel from this source.

Forty-five per cent of the firms surveyed were hiring “recent immigrants to Canada” and of these 19 per cent obtained over 50 per cent of their total hirings from this source. Thirteen per cent of all firms did some hiring “directly from abroad” and of these, 17 per cent obtained more than 50 per cent of their professional workers in this manner.

The relatively large proportion of employers who hire immigrants and the considerable percentage who recruit directly from abroad are further indications of the very tight labour market in Canada for almost all types of professional workers.

**. . . . MOST EMPLOYERS MEET THEIR REQUIREMENTS FROM CANADIANS
WITH PROFESSIONAL EXPERIENCE**

Of the Establishments Surveyed in the Industrial Sector



EFFECTS OF SHORTAGES

In the industrial sector, 363 firms or 50 per cent of the total number surveyed, reported shortages of professional personnel and described the effects of these shortages on their operations. The five effects most frequently mentioned are shown below, together with actual quotations from the returns of responding establishments.

Curtailment of production and expansion plans

- "Unable to undertake projects involving any amount of primary engineering."
- "Must refuse orders or contracts requiring special engineering design."
- "Restricted the expansion of our draughting and design department for which we have a considerable amount of work available."
- "Shortage of trained professional personnel has forced us to curtail our efforts to increase our current volume of work."
- "Inability to tender on all construction calls open to bidders."
- "Delivery dates extended due to shortages of electrical engineers for designing."
- "Shortage has limited expansion and lowered production rate."
- "The number of new clients is governed by the number of staff, instead of vice versa."

Curtailment of development and research activity

- "Research and product improvement retarded due to personnel shortages."
- "Postponement of projects that need careful and sometimes lengthy study and research."
- "Development program for new and improved lines delayed."
- "Curtailed development work on new products."
- "Has delayed new product design."

Overloading of present personnel

- "Have had to work an abnormal amount of overtime, thus reducing individual efficiency."
- "The shortage of valuable people has simply placed extra heavy load on our present personnel."
- "Senior engineers grossly overworked to the detriment of their efficiency."
- "Excessive amounts of overtime work has been necessary in most of our engineering and scientific departments."

Necessity of filling positions with inadequately trained personnel

- "Have had to use employees without professional training in positions normally filled by university graduates to the detriment of the work in many cases."
- "Have filled vacancies with personnel having lesser experience or qualifications."
- "Shortage of mining engineers has resulted in non-professional men being used in supervisory capacities."
- "Utilizing personnel not as well qualified."

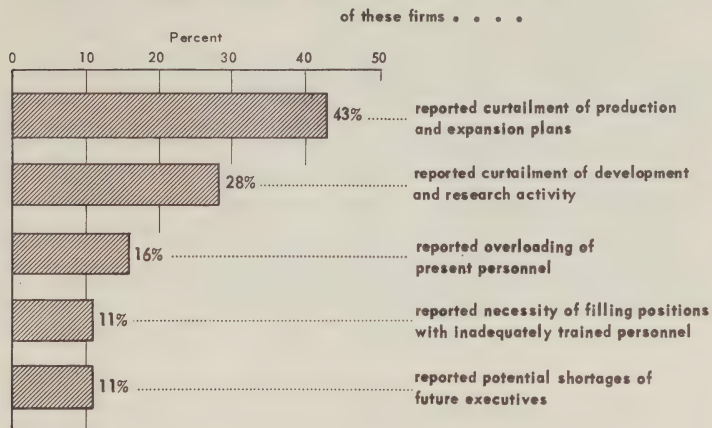
Potential shortage of future executives

- "Shortage of professionally trained personnel increases our difficulty in training and preparing men for future supervisory or executive positions."
- "Shortages have placed us in a position where we find ourselves ill-equipped to fill executive managerial positions."
- "Difficulty in obtaining university graduates hampers progress in our management replacement plans."
- "The shortage of professionally trained personnel has affected and will affect our long-range supervisory training program."

• • • • • SHORTAGES OF PROFESSIONAL PERSONNEL HAVE MEANT CURTAILMENT
OF PRODUCTION AND DEVELOPMENT ACTIVITY FOR MANY EMPLOYERS

IN THE INDUSTRIAL SECTOR

One-half of the reporting firms indicated shortages of professional
personnel and described the effects of these shortages • • • • •



IN THE COLLEGE AND UNIVERSITY SECTOR

The major effects of shortages were • • • • •

- • • • • increases in the teaching load
- • • • • hindrance of expansion
- • • • • curtailment of research
- • • • • hiring of unqualified personnel
- • • • • curtailment or impairment of seminar and laboratory work

IN THE GOVERNMENT SECTOR

The major effects of shortages were • • • • •

- • • • • Unable to meet all needs for services
- • • • • delay in research projects
- • • • • overloading of staff
- • • • • lowering of work standards

In the government sector, some of the agencies reporting shortages indicated the following effects upon their operations:

"Research reduced; staff overloaded; training hampered; only routine tasks being done."

"Surveys, research and development have given way to emergency projects for the time being."

"Programs delayed; research delayed; backlogs developed in control work."

"Overloading technical staff; work slowed down; restricted research and development in essential fields."

Shortages in the college and university sector were reported to have the following effects upon operations:

"Chief difficulty has been in curtailing range of courses, especially in third and fourth year, with a resultant lack of incentives for research."

"In general the effect has been increasing size of classes and, in some case employment of personnel not as well qualified as desired."

"Shortages have hampered the expansion of our programs of study and have in some cases caused enlarged classes."

"Postponement of improvements; curtailment of research; some increases in numbers in classes."

Part III—Analysis by Profession

ENGINEERING

1. Aeronautical Engineers

Estimate of Requirements

Returns from the survey indicate that in 1956, 1957 and 1958, requirements for aeronautical engineers will increase at a higher rate than those for specialists in other branches of engineering. As shown in the table below, the expected average annual rate of increase in total for aeronautical engineers during 1956-58, at 17.4 per cent, is comparable to the over-all increase in employment which occurred in 1955. The average rate of increase expected in industry, however, is lower than in 1955, but this reduction will be offset to a large extent by the greatly increased requirements anticipated by government agencies.

Requirements for Aeronautical Engineers

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	19.2	29.4	13.4	9.5	17.4
Industry	20.5	26.1	9.8	5.2	13.7
Colleges and universities	*	*	*	*	3.7
Government agencies	15.4	40.0	21.4	19.6	27.0

**Absolute figures too small for calculation of percentage changes.*

It is estimated that nearly two-thirds of aeronautical engineers in Canada are employed in industry and close to one-third are in the armed forces and civilian agencies of the federal government. In the industrial sector, manufacturers of aircraft and aircraft parts are by far the largest employers of aeronautical engineers.

Recruitment Difficulties

As shown in the table below, 26 per cent of employers of aeronautical engineers in industry reported that they had experienced recruiting difficulties in 1954-55, and 37 per cent anticipated recruiting difficulties in 1956-58. The difficulties of government agencies in recruiting aeronautical engineers were much more widespread, and are expected to persist on the same scale in 1956-58.

*Proportion of Employers of Aeronautical Engineers
Indicating Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	26	37
Colleges and universities	*	*
Government agencies	80	80

**Absolute figures too small for calculation of percentages.*

2. Civil Engineers

Estimate of Requirements

In 1956, 1957 and 1958, requirements for civil engineers are expected by employers to increase at an average annual rate of 9.1 per cent. As shown in the table below, this total rate of increase is almost the same as the actual increase in employment of civil engineers in 1955. The average rates of increase anticipated for 1956-58 by employers in industry and colleges and universities, however, are not quite as high as in 1955. But the effect of this reduction on the over-all requirements for civil engineers will be offset to a large extent by the increased requirements anticipated by government agencies.

Requirements for Civil Engineers

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	9.4	12.0	9.1	6.2	9.1
Industry	12.4	14.3	10.3	7.7	10.8
Colleges and universities	8.1	4.7	5.4	6.8	5.6
Government agencies	1.5	6.5	6.1	2.1	4.9

In the 1954 survey, employers in the industrial sector expected that their requirements for civil engineers in 1954-56 would increase at an average annual rate of 4.6 per cent. Actually, employment of civil engineers in industry increased by 12.4 per cent in 1955. For 1956-58, the average annual increase in requirements expected by industry is 10.8 per cent.

It is estimated that more than 25 per cent of civil engineers in Canada are employed by agencies of the federal and provincial governments, and more than 50 per cent are in construction, consulting firms, municipal governments, transportation; and public utilities. The survey

indicates that the rate of increase in requirements for civil engineers in 1956-58 will be highest in construction and consulting.

Recruitment Difficulties

The results of the present survey indicate that in 1954-55 government agencies and colleges and universities experienced much greater difficulties in recruiting civil engineers than employers in industry. As shown in the table below, 85 per cent of government agencies and 50 per cent of colleges and universities experienced difficulties, compared with only 36 per cent of employers in industry.

In 1956-58, the difficulties of government agencies and colleges and universities in recruiting civil engineers are expected to be even more widespread than in the earlier period while industry anticipates some lessening of recruitment problems.

*Proportion of Employers of Civil Engineers Indicating
Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	36	31
Colleges and universities	50	83
Government agencies	85	92

3. Chemical Engineers

Estimate of Requirements

Requirements for chemical engineers in 1956, 1957 and 1958 are expected by employers to increase at an average annual rate of 13.4 per cent. As shown in the table below, this rate of increase reflects to a large extent the fairly high increase in demand for chemical engineers anticipated by industrial employers. Lesser increases are anticipated by government agencies and colleges and universities, but in all three sectors the prospective increase in requirements for chemical engineers in 1956-58 will be proportionately higher than the increase recorded in these sectors in 1955.

In the survey conducted in industry in 1954, employers expected that their requirements for chemical engineers during 1954-56 would increase at an average annual rate of 8.2 per cent. For 1955, the actual rate of increase reported in the employment of chemical engineers in industry was 11.2 per cent. Requirements in 1956-58 are expected to increase at an average annual rate of 14.3 per cent.

It is estimated that chemical engineers employed in industry represent approximately 80 per cent of all chemical engineers in Canada.

Requirements for Chemical Engineers

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	9.1	16.0	13.3	11.0	13.4
Industry	11.2	16.5	14.7	11.8	14.3
Colleges and universities	—	12.5	4.4	10.6	9.2
Government agencies	2.9	16.2	10.7	6.7	11.2

The employers of the largest number in this sector are manufacturers of chemicals, pulp and paper, and non-ferrous metal products.

A substantial proportion of the additional requirements in 1956-58 is expected to originate in the chemical industry. The survey indicates that the average annual rate of increase in requirements for chemical engineers anticipated by manufacturers of chemicals is likely to be higher than the prospective rate of increase for industry as a whole.

Recruitment Difficulties

Difficulties in recruiting chemical engineers in 1954-55 were reported by approximately 40 per cent of employers of chemical engineers who co-operated in the survey. As shown in the table below, these difficulties were shared to much the same extent by employers in industry, government and colleges and universities. In 1956-58 recruitment difficulties are anticipated by virtually the same porportion of government agencies and industrial employers as in the earlier period, and by a somewhat larger proportion of colleges and universities.

Proportion of Employers of Chemical Engineers Indicating Recruitment Difficulties

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	40	42
Colleges and universities	38	50
Government agencies	43	43

4. Electrical Engineers

Estimate of Requirements

Employers of electrical engineers expect that in 1956-58 their requirements will increase at an average annual rate of 9.5 per cent. This

rate of increase is somewhat higher than the actual increase in employment of electrical engineers in 1955, for employers in industry as well as government agencies anticipate relatively higher requirements during the 1956-58 period. On a year-to-year basis the requirements for electrical engineers are shown in the following table.

Requirements for Electrical Engineers

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	6.8	11.1	9.4	8.1	9.5
Industry.....	5.8	9.9	9.3	8.4	9.2
Colleges and universities	19.7	5.9	10.0	6.1	7.3
Government agencies	12.7	22.6	10.5	6.2	13.1

On the basis of the 1954 survey covering industry, requirements for electrical engineers in 1954-56 were expected to increase at an annual average rate of 8 per cent. Actually, in 1955, employment of electrical engineers in industry increased by 5.8 per cent. For 1956-58, the average annual increase in requirements is expected by industry to be 9.2 per cent.

Close to 90 per cent of all electrical engineers in Canada are employed in industry. Of these, the largest proportion is employed by manufacturers of electrical equipment and by public utilities.

Recruitment Difficulties

The results of the present survey indicate that in 1954-55 government agencies experienced difficulties in recruiting electrical engineers to a much greater extent than employers in industry or colleges and universities. As shown in the following table, recruitment difficulties in 1954 were reported by 40 per cent of employers of electrical engineers in industry, and by 79 per cent of government agencies. It is expected that in 1956-58 employers in industry and government agencies will experience recruitment difficulties to the same extent as in the earlier period. Increased difficulties are anticipated by colleges and universities.

*Proportion of Employers of Electrical Engineers Indicating
Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	40	40
Colleges and universities	42	58
Government agencies	79	79

5. Geological Engineers

Estimate of Requirements

Requirements for geological engineers in 1956-58 are expected by employers to increase at an average annual rate of 12.4 per cent. Practically all of the increase is expected to originate in industry and since industrial establishments employ by far the largest number of geological engineers in Canada, this will largely determine the over-all demand. On a year-to-year basis, prospective requirements in the three sectors are shown below.

Requirements for Geological Engineers

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total.....	7.6	18.7	11.2	7.4	12.4
Industry.....	8.3	20.6	12.1	7.6	13.4
Colleges and universities.....	*	*	*	*	2.4
Government agencies.....	—	1.7	3.4	4.9	3.3

**Absolute figures too small for calculation of percentage changes.*

On the basis of the 1954 survey covering industry, the average annual increase in requirements for geological engineers in 1954-56 was expected to be 8.4 per cent. The present survey indicates that in 1955, the actual increase in employment of geological engineers was 8.3 per cent. For 1956-58, an average annual increase in requirements of 13.4 per cent is expected by industry.

It is estimated that approximately 90 per cent of all geological engineers in Canada are employed in industry. By far the largest number of these are employed in the mining and petroleum industries.

Recruitment Difficulties

Approximately 30 per cent of industrial establishments employing geological engineers reported that they had experienced recruitment difficulties in 1954-55, and some 26 per cent anticipate recruitment difficulties in 1956-58. Recruitment difficulties reported by government agencies and colleges and universities appear to be comparable to those experienced by industry but the small number of employers of geological engineers in these two sectors did not make it practicable to calculate the extent of the difficulties in percentage terms.

6. Mechanical Engineers

Estimate of Requirements

In 1956-58 requirements for mechanical engineers are expected by employers to increase at an average annual rate of 14.4 per cent. As shown in the table below, this rate of increase reflects the continuing strong demand for mechanical engineers anticipated by employers in the industrial sector. Much lower increases are expected by government agencies and colleges and universities, but this will not have an appreciable effect on the over-all demand because these sectors employ only a small proportion of all mechanical engineers in Canada.

Requirements for Mechanical Engineers

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	13.9	17.8	14.3	11.2	14.4
Industry	14.6	18.7	14.5	11.7	15.0
Colleges and universities	5.1	4.9	9.3	10.6	8.3
Government agencies.....	8.4	10.8	13.2	5.5	9.8

In the survey conducted in 1954 in industry, employers estimated that their requirements for mechanical engineers in 1954-56 would increase at an average annual rate of 9.1 per cent. The present survey shows that employment of mechanical engineers in industry actually increased by 14.6 per cent in 1955. In 1956-58, requirements for mechanical engineers in industry are expected to increase at an average annual rate of 15.0 per cent.

Mechanical engineers employed in industry are estimated to represent approximately 90 per cent of all mechanical engineers in Canada. The major industrial employers are manufacturers of iron and steel products, pulp and paper, transportation equipment, petroleum products, and electrical equipment. Outside manufacturing, a large number of mechanical engineers are in the consulting field.

Recruitment Difficulties

Difficulties in recruiting mechanical engineers in 1954-55 were reported by 47 per cent of the industrial establishments that employ them, and by a somewhat higher proportion of government agencies. As shown in the table below, recruitment difficulties in these two sectors are expected to follow much the same pattern in 1956-58. Colleges and universities, on the other hand, did not experience recruitment problems to quite the same extent as did other sectors in 1954-55, but anticipate that their difficulties in recruiting mechanical engineers will become more widespread in 1956-58.

*Proportion of Employers of Mechanical Engineers
Indicating Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	47	49
Colleges and universities.....	33	67
Government agencies	53	53

7. Metallurgical Engineers

Estimate of Requirements

Requirements for metallurgical engineers in 1956, 1957 and 1958 are expected by employers to increase at an average annual rate of 13.4 per cent. This rate of increase is not quite as high as the over-all increase in employment of metallurgical engineers in 1955, mainly because employers in the industrial sector do not anticipate their additional requirements to be as heavy in 1956-58. On an annual basis, prospective requirements for metallurgical engineers are shown in the following table.

Requirements for Metallurgical Engineers

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	19.4	17.1	14.0	9.1	13.4
Industry	19.3	17.1	12.5	8.9	12.8
Colleges and universities	5.6	10.5	9.5	4.3	8.1
Government agencies	23.5	19.0	32.0	12.1	21.0

In the 1956 survey conducted in industry, employers of metallurgical engineers expected that in 1954-56 their requirements would increase at an average annual rate of 7.3 per cent. According to the present survey, employment of metallurgical engineers in industry actually increased by 19.3 per cent in 1955. For 1956-58, employers in industry anticipate that their requirements will increase at an average rate of 12.8 per cent.

Metallurgical engineers working in industry are estimated to represent approximately 90 per cent of all metallurgical engineers in Canada. The major employers are mining and smelting companies, manufacturers of iron and steel products and manufacturers of non-ferrous metal products.

Recruitment Difficulties

Returns from the present survey indicate that in 1954-55 government agencies experienced difficulties in recruiting metallurgical engineers to

a somewhat greater extent than employers in industry or colleges and universities. As shown in the following table, recruitment difficulties in 1954-55 were reported by 50 per cent of government agencies and approximately 30 per cent of employers in the other two sectors. It is expected that in 1956-58 employers in industry and government agencies will experience recruitment difficulties to much the same extent as in the earlier period, but increased difficulties are anticipated by colleges and universities.

*Proportion of Employers of Metallurgical Engineers
Indicating Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	31	32
Colleges and universities	29	43
Government agencies	50	50

8. Mining Engineers

Estimate of Requirements

In 1956, 1957 and 1958, requirements for mining engineers are expected by employers to increase at a lower rate than requirements for specialists in other branches of engineering. The anticipated average annual rate of increase, at 6.5 per cent, reflects largely the prospective increases in requirements indicated by employers in industry and colleges and universities. A lower rate of increase is expected by government agencies, but this will not have an appreciable effect on over-all demand because these agencies employ only a very small proportion of all mining engineers in Canada. On an annual basis the prospective requirements for mining engineers are as follows:

Requirements for Mining Engineers

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	5.4	9.2	6.1	4.2	6.5
Industry.....	5.3	10.1	6.3	4.3	6.9
Colleges and universities	5.6	—	10.5	9.5	7.6
Government agencies	6.2	1.3	2.7	2.2	2.1

On the basis of the 1954 survey covering industry, requirements for mining engineers in 1954-56 were expected to increase at an average annual rate of 8.1 per cent. Actually, employment of mining engineers in

industry increased by 5.3 per cent in 1955. For 1956-58, employers in industry anticipate that their requirements will increase at an average rate of 6.9 per cent.

It is estimated that approximately 90 per cent of all mining engineers in Canada work in industry. Most of these are employed by mining companies and fairly large numbers are engaged in consulting work.

Recruitment Difficulties

Difficulties in recruiting mining engineers in 1954-55 were reported by 42 per cent of industrial establishments employing mining engineers and by a somewhat lower proportion of government agencies. As shown in the table below, recruitment difficulties in these two sectors are expected to follow much the same pattern in 1956-58. Colleges and universities did not experience recruitment problems in the earlier period, nor do they expect to have serious difficulties in 1956-58, but this may be due in part to the low volume of hiring reported in this sector.

*Proportion of Employers of Mining Engineers
Indicating Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	42	44
Colleges and universities	—	14
Government agencies	38	38

SCIENCES

1. Biologists

Estimate of Requirements

In 1956-58, requirements for biologists are expected by employers to increase to a lesser degree than for other professions in the science field. The expected annual rate of increase, at 7.5 per cent, is nevertheless substantially higher than the over-all increase in employment of biologists recorded in 1955. As shown in the table below, the low 1955 total reflects the slight decline recorded in that year in the government sector, where some agencies apparently were unable to fill vacancies that arose during the year.

On the basis of the 1954 survey conducted in industry, the average annual net increase in employment of biologists in 1954-56 was expected to be 3.8 per cent. Actually, employment of biologists in industry increased by 3.0 per cent in 1955. In 1956-58, requirements in industry are expected to increase at an average annual rate of 5.6 per cent.

Requirements for Biologists

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	1.7	9.2	7.5	5.8	7.5
Industry	3.0	5.9	8.3	2.6	5.6
Colleges and universities	4.1	6.5	8.0	7.4	7.3
Government agencies	-0.7 *	12.9	6.8	6.4	8.7

* decrease

It is estimated that approximately 45 per cent of all biologists working in Canada are employed by government agencies, 30 per cent by colleges and universities, and 25 per cent by industry.

Recruitment Difficulties

Returns from the survey indicate that in 1954-55 government agencies experienced problems in recruiting biologists to a greater extent than either industry or colleges and universities. Over 40 per cent of government agencies employing biologists reported recruiting difficulties in 1954-55.

The survey reports indicate that government agencies experienced greater difficulties in recruiting biologists in this period than in recruiting any other of the scientists except physicists.

Only 20 per cent of colleges and universities and 17 per cent of employers of biologists in industry reported recruitment difficulties in 1954-55. As the table below indicates, these problems are expected to follow much the same pattern in 1956-58, although a slight increase in recruitment difficulties is anticipated by colleges and universities.

Proportion of Employers of Biologists Indicating Recruitment Difficulties

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	17	17
Colleges and universities	20	25
Government agencies	42	42

2. Chemists

Estimate of Requirements

Requirements for chemists in 1956, 1957 and 1958 are expected to increase at a somewhat higher rate than for other professions in the science

field. The estimated average annual rate of increase, at 10.5 per cent, reflects to a large extent the fairly high increase in demand anticipated by employers in the industrial sector. Lesser increases are expected by government agencies and colleges and universities. On an annual basis, the requirements for chemists in the three sectors are shown below.

Requirements for Chemists

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	3.9	12.6	9.9	8.9	10.5
Industry	3.5	13.4	11.0	10.0	11.5
Colleges and universities.....	8.4	10.7	8.8	6.5	8.7
Government agencies.....	3.4	9.0	4.5	4.2	5.9

In the survey conducted in 1954 in industry, employers estimated that the average annual net increase in requirements for chemists during 1954-56 would amount to 7.8 per cent. The present survey shows that employment of chemists in industry in 1955 actually increased by 3.5 per cent. In 1956-58, requirements are expected to increase at an annual average rate of 11.5 per cent.

It is estimated that over 75 per cent of all chemists working in Canada are employed in industry. The largest employers are manufacturers of chemical products, pulp and paper mills, and food processing plants. A substantial proportion of the additional requirements for chemists in 1956-58 is expected to originate in the chemical industry. The survey indicates that the average annual rate of increase in requirements for chemists expected by manufacturers of chemicals is higher than the rate of increase anticipated for industry as a whole. The rate of increase in requirements in pulp and paper mills and food processing plants, on the other hand, is expected to be slightly below the industry-wide average.

Recruitment Difficulties

The results of the survey indicate that in 1954-55 employers had fewer difficulties in recruiting chemists than in obtaining professionals in any other field of science. Only 16 per cent of employers of chemists in the industrial sector reported recruiting problems during this period. Government agencies and colleges and universities reported a somewhat higher incidence of recruiting difficulties than industry.

As shown in the table below, employers in industry and particularly colleges and universities anticipate increased difficulties in recruiting chemists in the 1956-58 period. Government agencies expect fewer difficulties.

*Proportion of Employers of Chemists Indicating
Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	16	19
Colleges and universities.....	20	40
Government agencies.....	23	18

3. Geologists

Estimate of Requirements

Requirements for geologists in 1956, 1957 and 1958 are expected by employers to increase at an average annual rate of 8.9 per cent. As shown in the table below, this increase is somewhat lower than the increase in employment of geologists in 1955, as the additional requirements anticipated for 1956-58 by employers in industry and colleges and universities are on the average below the corresponding 1955 figures. The requirements for geologists in industry, however, are expected to continue to increase at a higher rate than in the other two sectors.

Requirements for Geologists

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	10.8	11.9	8.3	6.4	8.9
Industry	12.7	13.3	9.5	7.9	10.2
Colleges and universities	8.8	9.7	7.4	2.7	6.6
Government agencies	4.4	7.8	3.9	2.5	4.7

In the survey conducted in 1954 in industry, the average annual net increase in employment of geologists in 1954-56 was expected to be 14.8 per cent. In 1955 employment of geologists in industry actually increased 12.7 per cent and for 1956-58, the average annual increase is expected to be 10.2 per cent

It is estimated that over two-thirds of all geologists in Canada are in the industrial sector. Most of these are employed in the mining and petroleum industries, or are in private practice in the consulting field.

Recruitment Difficulties

Difficulties in recruiting geologists in 1954-55 were reported by 25 per cent of employers of geologists in the industrial sector, and by a somewhat higher proportion of government agencies. As shown in the

table below, these difficulties are expected to persist in the 1956-58 period in the government sector. In industry and colleges and universities, it is anticipated that difficulties will be experienced by a larger number of employers than in the earlier period.

*Proportion of Employers of Geologists Indicating
Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	25	28
Colleges and universities	6	12
Government agencies	33	33

4. Mathematicians

Estimate of Requirements

Employers of mathematicians expect that in 1956, 1957 and 1958 their requirements will increase at an annual average rate of 10.1 per cent. The largest relative increase in demand, 14.0 per cent, is indicated in industry and is higher than that anticipated for any other science profession in the industrial sector, except physicists. As shown on a year-to-year basis in the table below, the relative increase in demand for mathematicians on the part of government agencies and colleges and universities is expected to amount to less than half the rate of increase anticipated by industry.

Requirements for Mathematicians

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	5.7	10.6	10.5	9.1	10.1
Industry	5.2	14.8	15.3	12.0	14.0
Colleges and universities.....	8.1	6.8	5.2	6.1	6.0
Government agencies	5.2	6.0	5.7	6.0	5.9

On the basis of the 1954 survey covering industry, the average annual net increase in requirements for mathematicians in 1954-56 was expected to be 8.0 per cent. The actual rate of increase in the employment of mathematicians in industry in 1955 was 5.2 per cent.

It is estimated that close to 50 per cent of all mathematicians in Canada are employed by government agencies and colleges and universities, and the remainder by industry. In the industrial sector a large number of mathematicians are employed as actuaries in the insurance field.

Recruitment Difficulties

Difficulties in recruiting mathematicians in 1954-55 were reported by a little more than half of colleges and universities and by approximately one-third of employers of mathematicians in the industrial and government sectors. As indicated in the table below these difficulties are not expected to increase to an appreciable extent in 1956-58.

*Proportion of Employers of Mathematicians Indicating
Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	35	39
Colleges and universities	55	60
Government agencies	30	30

5. Physicists

Estimate of Requirements

It is anticipated that requirements for physicists in 1956, 1957 and 1958 will increase at an average annual rate of 9.7 per cent. As shown in the table below, the relative increase in demand for physicists anticipated by employers in industry is substantially higher than that expected by government agencies and colleges and universities. The survey shows that, at 16.6 per cent, the average annual rate of increase in requirements for physicists expected by industry is higher than for any other science profession in the industrial sector. The effect of this increase on the over-all requirements for physicists, however, is offset to a considerable extent by the lesser requirements of government agencies and colleges and universities, which between them employ approximately 70 per cent of all physicists working in Canada.

Requirements for Physicists

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	7.8	11.7	8.2	9.1	9.7
Industry	15.0	23.2	13.5	13.0	16.6
Colleges and universities	6.6	5.6	5.9	8.3	6.6
Government agencies	4.0	7.7	6.0	7.1	6.9

In the survey conducted in 1954 in industry, employers anticipated that the average annual net increase in employment of physicists during

1954-56 would amount to 8.6 per cent. The actual rate of increase in 1955 was 15 per cent.

It is estimated that of all physicists in Canada nearly 50 per cent are employed by government agencies, more than 20 per cent by colleges and universities and the remainder by industry. In the industrial sector the largest employers of physicists are the mining industry and manufacturers of chemicals and electrical equipment. By far the largest proportion of additional requirements for physicists in 1956-58 in the industrial sector is expected to originate in these three industries, with a particularly high relative rate of increase indicated by manufacturers of electrical equipment.

Recruitment Difficulties

Difficulties in recruiting physicists in 1954-55 were reported by 37 per cent of employers of physicists in the industrial sector and by a substantially higher proportion of government agencies and colleges and universities. The present survey suggests that in the latter two sectors the difficulties encountered in recruiting physicists were more widespread than in the recruitment of other professionals in the science field. As the table below shows, the difficulties in each sector are not expected to change to any appreciable extent in 1956-58.

*Proportion of Employers of Physicists Indicating
Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	37	31
Colleges and universities	70	75
Government agencies	56	56

OTHER PROFESSIONS

1. Architects

Estimate of Requirements

Requirements for architects in 1956, 1957 and 1958 are expected by employers to increase at an average annual rate of 9.7 per cent. As shown in the table below, the average annual rates of increase anticipated by industry and colleges and universities for 1956-58 are comparable to the increases recorded in these sectors in 1955. In the government sector, where employment of architects in 1955 showed a much higher relative increase than in industry or education, additional requirements for architects are expected to decline in 1957 and 1958.

In the survey conducted in 1954 in industry, employers anticipated that the average annual net increase in requirements for architects in

Requirements for Architects

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	12.7	14.8	7.8	6.4	9.7
Industry	11.9	13.9	8.2	6.7	9.6
Colleges and universities	7.5	13.9	2.4	7.1	7.8
Government agencies	21.4	22.4	6.5	3.7	10.9

1954-56 would amount to 5.3 per cent. In 1955, the actual rate of increase recorded was 11.9 per cent. In 1956-58 requirements for architects in industry are expected to increase at an average annual rate of 9.6 per cent.

It is estimated that nearly 70 per cent of all architects in Canada are working in establishments engaged in the provision of architectural services. Another 10 per cent are employed by agencies of the federal and provincial governments, and approximately 4 per cent by colleges and universities.

Recruitment Difficulties

Difficulties in recruiting architects in 1954-55 were reported by one-third of employers of architects in the industrial sector, and by a substantially higher proportion of government agencies. As shown in the table below, these difficulties are expected to follow much the same pattern in 1956-58.

Proportion of Employers of Architects Indicating Recruitment Difficulties

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	34	32
Colleges and universities	*	*
Government agencies	60	53

**Absolute figures too small for calculation of percentages*

2. Agriculture

Estimate of Requirements

Returns from the survey indicate that in 1956, 1957 and 1958 requirements for graduates in agriculture will increase at an average annual rate of 5 per cent. As shown in the table below, this rate of increase is comparable to the over-all increase in employment of agriculturists that

occurred in 1955. The average rate of increase expected in industry, however, is lower than in 1955, but this reduction will be offset to a large extent by the increased additional requirements anticipated by government agencies and colleges and universities.

Requirements for Agriculturists

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	5.8	6.7	4.5	3.9	5.0
Industry	11.9	9.8	6.5	5.7	7.3
Colleges and universities	1.9	9.4	1.7	5.1	5.4
Government agencies	1.6	3.7	3.4	2.3	3.1

In the 1954 survey covering industry, employers expected that their requirements for agriculturists in 1954-56 would increase at an average annual rate of 5.6 per cent. In fact, employment of agriculturists in industry in 1955 showed an increase of 11.9 per cent. For 1956-58 the average annual increase in requirements expected by industry is 7.3 per cent.

It is estimated that approximately 50 per cent of all university-trained agriculturists in Canada are employed by government agencies, and some 10 per cent by colleges and universities. In the industrial sector, the largest employers are food-processing establishments and manufacturers of chemicals. Slightly more than 10 per cent of graduates in agriculture are engaged in farming operations on their own account.

Recruitment Difficulties

Only 4 per cent of employers of agriculturists in industry experienced recruitment difficulties in 1954-55, and 9 per cent anticipate recruitment difficulties in 1956-58. As shown in the table below, government agencies experienced recruiting difficulties to a greater extent than employers in industry; they expect that their difficulties will remain the same in 1956-58.

*Proportion of Employers of Agriculturists Indicating
Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	4	9
Colleges and universities	*	*
Government agencies	17	17

**Absolute figures too small for calculation of percentages.*

3. Forestry

Estimate of Requirements

In 1956-58 requirements for forestry specialists are expected by employers to increase at an annual average rate of 5.8 per cent. As shown in the table below, this anticipated annual rate of increase is substantially higher than the over-all increase in employment of forestry specialists recorded in 1955. The difference is particularly pronounced in the government sector, where employment of forestry specialists in 1955 actually showed a moderate decline as some agencies were unable to find replacements for those who resigned during the year.

Requirements for Forestry Specialists

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	0.4	4.9	6.6	5.8	5.8
Industry	2.3	4.8	6.3	4.6	5.2
Colleges and universities	—	11.1	—	10.0	7.0
Government agencies	-2.0*	4.5	7.6	7.1	6.4

*Decrease

In the survey conducted in 1954 in industry, employers estimated that the average annual net increase in requirements for forestry specialists during 1954-56 would amount to 3.8 per cent. This compares with an actual increase of 2.3 per cent in 1955. In 1956-58, requirements for forestry specialists in industry are expected to increase at an annual average rate of 5.2 per cent.

It is estimated that a little more than half of all forestry specialists in Canada work in industry, and approximately 40 per cent are employed by government agencies. In the industrial sector, the logging and pulp and paper industries are by far the largest employers.

*Proportion of Employers of Forestry Specialists Indicating
Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	25	30
Colleges and universities	*	*
Government agencies	36	36

*Absolute figures too small for calculation of percentages.

Recruitment Difficulties

As shown in the preceding table, 25 per cent of employers in industry reported difficulties in recruiting forestry specialists in 1954-55, and 30 per cent anticipate recruitment difficulties in 1956-58. Government agencies experienced recruitment difficulties to a greater extent than employers in industry and expect that their difficulties will persist in 1956-58.

4. Accountants

Estimate of Requirements

In 1956-58, requirements for degree accountants (C.A., C.G.A., C.P.A.) are expected to increase at an average annual rate of 8.5 per cent. As shown in the table below, the average rate of increase in demand anticipated by employers in industry for 1956-58 is comparable to the actual increase in employment of degree accountants in this sector in 1955. The prospective additional requirements of government agencies and particularly of colleges and universities are up from 1955, but this will not have an appreciable effect on over-all demand because these sectors employ only a small proportion of all degree accountants in Canada.

Requirements for Degree Accountants

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	8.3	10.6	7.9	6.9	8.5
Industry	9.0	11.4	7.9	7.1	8.8
Colleges and universities	6.7	6.3	17.6	10.0	11.3
Government agencies	4.1	6.3	6.1	4.9	5.8

In the survey conducted in 1954 in industry, employers estimated that their requirements for degree accountants in 1954-56 would increase at an average annual rate of 4.1 per cent. The present survey shows that the actual rate of increase in this sector in 1955 was 9.0 per cent. In 1956-58, requirements for accountants in industry are expected to increase at an average annual rate of 8.8 per cent.

It is estimated that approximately 85 per cent of all degree accountants in Canada are associated with auditing and accounting firms, or are employed in banking, insurance, trade, manufacturing and other establishments outside government agencies and colleges and universities. Of the remaining 15 per cent the great majority are employed by government agencies.

Recruitment Difficulties

Difficulties in recruiting degree accountants in 1954-55 were reported by 50 per cent of government agencies but by a much smaller proportion of employers of accountants in the industrial sector. No colleges and universities covered in the survey indicated that they had experienced recruitment difficulties during the same period. As shown in the following table, difficulties in recruiting accountants are expected to follow much the same pattern in 1956-58.

Proportion of Employers of Degree Accountants Indicating Recruitment Difficulties

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	9	9
Colleges and universities	—	—
Government agencies	50	57

5. Commerce or Business Administration

Estimate of Requirements

Employers of graduates in commerce or business administration anticipate that in 1956-58 their requirements will increase at an average annual rate of 13.5 per cent. This rate of increase is somewhat higher than the actual increase in employment of commerce graduates in 1955, and largely reflects the continuing strong demand anticipated by employers in industry and colleges and universities. The prospective additional requirements of government agencies are likewise up from 1955, but the rate of increase will remain much lower than in the other two sectors. On an annual basis, the prospective requirements for commerce or business administration graduates are shown below.

Requirements for Commerce Graduates

Sector	Percentage Net Increase				
	Actual 1955	Forecast			
		1956	1957	1958	Annual Average 1956-58
Total	11.5	14.7	13.6	12.2	13.5
Industry	12.7	16.1	14.9	13.4	14.8
Colleges and universities	14.0	22.8	8.6	10.5	14.0
Government agencies	3.4	4.6	5.9	5.6	5.4

On the basis of the 1954 survey covering industry, the average annual increase in requirements for commerce or business administration

graduates in 1954-56 was expected to be 11 per cent. The present survey shows that their employment in industry actually increased by 12.7 per cent in 1955. For 1956-58, the average annual rate of increase in requirements in this sector is expected to be 14.8 per cent.

It is estimated that approximately 85 per cent of all commerce and business administration graduates in Canada are employed in banking, insurance, trade, manufacturing and other establishments outside government agencies and colleges and universities. Of the remaining 15 per cent the great majority are employed by government agencies.

Recruitment Difficulties

The results of the present survey indicate that in 1954-55 government agencies and colleges and universities experienced difficulties in recruiting commerce and business administration graduates to a greater extent than employers in the industrial sector. As shown in the following table, 33 per cent of government agencies and 29 per cent of colleges and universities experienced difficulties, compared with only 14 per cent of employers in the industrial sector. It is expected that in 1956-58, employers in industry and government agencies will experience recruitment difficulties to much the same extent as in the earlier period. Increased difficulties are anticipated by colleges and universities.

*Proportion of Employers of Commerce Graduates Indicating
Recruitment Difficulties*

Sector	1954-55	1956-58
	(Per cent)	(Per cent)
Industry	14	12
Colleges and universities	29	36
Government agencies	33	33

Appendix

Coverage

At January 1, 1956, the establishments co-operating in the 1956 survey of requirements for professional personnel employed a total of 30,200 persons in the 18 professional categories covered in this report. Of these, 19,930 were employed by industry, 1,425 by colleges and universities, and 8,845 by government agencies. The number of persons covered in each professional category was as follows:

Total (18 professional categories).....	30,200
Engineering	16,915
Aeronautical	315
Chemical	2,011
Civil	3,551
Electrical	4,108
Geological	490
Mechanical	3,851
Metallurgical	578
Mining	1,081
Other	930
Sciences	5,052
Biology	663
Chemistry	2,029
Geology	548
Mathematics	807
Physics	1,005
Other professions	8,233
Architects	572
Agriculture	2,532
Forestry	939
Degree accountants	1,372
Commerce or business administration	2,818

Questionnaire

This report is based on analysis of information contained in the following questionnaire which was used in the industrial sector of the survey. Almost identical questionnaires were completed by the government departments and agencies and colleges and universities co-operating in the survey.

Two questions appearing in the questionnaires used, one on the reasons for the difficulties experienced in recruiting professionally-trained personnel and the other on ways in which employers help their professional staff secure further training, were not analysed for the report since the information obtained was not sufficiently detailed to be meaningful.

1. See opposite page.

2. (a) Have you experienced any difficulties in recruiting any categories of professionally-trained personnel in the *past two years*? Yes...() No...()
(If *yes* please specify categories)

.....

(b) Do you anticipate any difficulties in recruiting any categories of professionally-trained personnel in the *next three years*? Yes...() No...()
(If *yes* please specify categories)

.....

3. If you have experienced shortages of professionally-trained personnel, explain briefly the effect which these shortages have had upon your operations, such as production, research, etc.

.....

.....

.....

.....

4. Approximately what per cent of your *hirings* of professionally-trained personnel are:

(a) New university graduates .....	.....	per cent
(b) Experienced Canadian professional persons .....	.....	per cent
(c) Recent immigrants already in Canada .....	.....	per cent
(d) Obtained outside Canada through active recruitment .....	.....	per cent
(e) Other, specify .....	.....	per cent

100

1. Estimate of Your Requirements for Professionally-Trained Personnel
*Include only university-trained personnel and members of recognized professional organizations
Do not include university students employed for summer months only*

Field of Specialization	Number Employed at January 1 1955	Number Employed at January 1 1956	During 1956		During 1957		During 1958	
			Expected NET (1) increase in number employed	Expected NET (1) decrease in number employed	Expected NET (1) increase in number employed	Expected NET (1) decrease in number employed	Expected NET (1) increase in number employed	Expected NET (1) decrease in number employed
Engineering:								
Aeronautical								
Chemical								
Civil								
Electrical								
Geological								
Mechanical								
Metallurgical								
Mining								
Other Engineers								
Agriculture								
Architects								
Biology								
Chartered Accounts CA and CGA								
Chemistry								
Commerce or Business Administration								
Forestry								
Geology								
Mathematics								
Physics								
Other - (Please specify)								
.....								
.....								
.....								

(1) By "NET" is meant all hirings less separations. Separations include retirements.

5. Total number of all employees as of January 1, 1956

Name of firm

Address

Date

Name and position of person answering questionnaire

.....
.....

If from your experience you have any opinion concerning amount and adequacy of university training, utilization of professional personnel, etc. we would appreciate your comments.

Explanatory Notes

Question 1 is designed to obtain for your organization estimates of net requirements for professionally-trained personnel in 1956, 1957 and 1958. Future circumstances that cannot be foreseen at the moment may show your estimates to be too high or too low, but estimates made by employers are more accurate than those gained in other ways.

Question 2 is intended to obtain information on the specific types of professionally-trained personnel that have been or are expected to be in short supply.

Question 3 is designed to evaluate the effects of any short supply of professionally-trained persons on the operations of Canadian business. It is realized that such effects are difficult to measure, but a qualitative statement outlining the impact of such shortages on your business would be most helpful.

Question 4 is designed to determine the major sources of supply of professionally-trained personnel for Canadian business.

The information furnished by you will be regarded as confidential and figures from individual firms will not be disclosed.

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
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